



Raster Data Transfer Test Using Formtek Produced Data: MIL-R-28002 Type I (Raster)



DEFENSE LOGISTICS AGENCY



Prepared for
Air Force Logistics Command
ATIT Project



Lawrence Livermore National Laboratory

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**Raster Data Transfer Test
Using Formtek Produced
Data: MIL-R-28002
Type I (Raster)**

Quick Short Test Report

June 14, 1990

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1 Background and Test Objectives

The DoD Computer-aided Acquisition and Logistics Support (CALS) Test Network (CTN) is conducting tests of the military standard for the Automated interchange of Technical Information, MIL-STD-1840A, and its companion suite of specifications. The CTN is a DoD sponsored confederation of voluntary participants from industry and government, managed by the Air Force Logistics Command.

The primary purpose of the CTN is to evaluate the effectiveness of the CALS standards for technical data interchange and to demonstrate the capability and operational suitability of these standards.

To this end, testing should represent the systems and applications in use by a large number of participants. Sampling a wide cross section of industry and government will gain feedback on the various interpretations of the standards and broaden the base of industry participation in the CALS initiative.

This test was conducted to allow Formtek to demonstrate their ability to generate a MIL-R-28002 data file. The objective was to evaluate their interpretation of the MIL-R-28002 standard thereby assist the CTN in substantiating the validity of the standards or recommending changes to these standards and the references to national or international standards.

Additionally, Quick Short Test Reports (QSTRs) are intended to promote industry and government participation in the CALS initiative, developing a level of confidence in the technology and furthering mission objectives.

2 Test Parameters

Test Plan: Informal data transfer between LLNL Weapons Engineering Division (WED) and Formtek.

Date of Evaluation: May 5, 1990

Evaluator: Lawrence Livermore National Laboratory
P.O. Box 808, L-542
Livermore, CA 94550

Data Originator: Formtek
1050 Marina Village Parkway
Alameda, Ca 94501

Data Description: Three (3) MIL-R-28002 Type I files written to IBM-PC 5.25" floppy disk.

Data Source Systems: Formtek Model 4240 -S Scanner
DIO-300 Plot/Scanner Interface board
FORM:Scan Server, FORM: Scan client,
FORM:plot, FORM: convert

Evaluation Tools Used: IBM PC-AT, MS-DOS
SUN 3/60, UNIX
CALS Tool Box "calstb.350"

Standards Tested: MIL-STD-1840A Notice 1 (1840A)
MIL-R-28002 Type 1 (28002) Amendment 1

3 1840A Analysis

Data was delivered on a 5.25" floppy disk, precluding any 1840A test of the transfer media or transfer format. Since MIL-STD-1840A currently only addresses 9-track magnetic tape as an exchange medium, full 1840A analysis could not be conducted.

Image orientation was not considered an issue during this test. The MIL-R-28002 documentation is ambiguous in its definition of the orientation parameter. The intent of specifying raster image orientation (header record 8 "rorient:") is to allow the receiving system to render a right- reading image. Images may be scanned in any orientation; it is the responsibility of the system which generates the image to indicate, through the orientation parameter, which direction the pixel path and scan line progressions are to take.

3.1 1840A External Packaging Analysis

Not applicable to this test.

3.2 1840A Transmission Envelope Analysis

Not applicable to this test.

3.2.1 Tape Formats

Not applicable to this test.

3.2.2 Declaration Files

No declaration file was delivered with the data.

4 Raster Analysis

MIL-STD-1840A references ANSI x3.27 for magnetic tape labeling and file structure. X3.27 6.3.4 specifies "Blocks within a file are padded out to the desired length by the use of 'circumflex accent' characters.....". All the files in this test used "space" characters. However, since the data was not transferred by magnetic tape, the requirement is not applicable.

3.1 FILE "d111r 001"

3.1.1 File Header Records (MIL-R-28002)

1840A header data-

srcdocid: NONE
dstdocid: NONE
txtfilid: NONE
figid: NONE
srcgph: NONE
doccls: UNCLASS
rtype: 1
rorient: 000,270
rpelcnt: 008800,006800
rdensy: 0200
notes: NONE

4.1.2 File Structure (MIL-R-28002)

File size: 169088 bytes

header size 2048: OK

record size 128: OK

header padding (^~^...): N/A

First line encoding: Valid CCITT T.6 encoding

octal 020076 146433 042441

binary 001000000011110 1100110100011011 0100010100100001

T.6 001

horizontal

000000011111

make-up(2560)

0 11001101

make-up(768)

00011011

terminate(32)

010

terminate(1)

001

horizontal

0100100

terminate(27)

001

horizontal

End-of-file mark: Valid CCITT T.6 end-of-file mark
octal 155200 004000 100040
binary 1101101010000000 0000100000000000 1000000001000000
T.6 0000000 0000100000000000 1
 EOF

4.1.3 Image Presentation (CCITT Group-4)

- decompression: The file decompressed without coding errors and an engineering drawing image was displayed in landscape mode.
- cropped and centered: The drawing image displayed with 2 of the borders in tact. The top boarder was cropped at the right side due to a skewed scan. The right border was obscured by data anomalies.
- orthographic alignment: The aspect ratio appeared reasonable. No data objects were to "fat" or to "thin". Parallel lines appeared linear leaving no perceptible image distortion.
- image continuity: The image was complete with no obvious dropouts or misalignment due to scanner read errors.
- image fidelity: Image contrast was light. The left border of the page was not completely captured and thin lines were not being captured correctly. The background was clean and free of noise.

4.2. FILE "d112r001"

4.2.1 File Header Records (MIL-R-28002)

1840A header data
srcdocid: NONE
dstdocid: NONE
txtfilid: NONE
figid: NONE
srcgph: NONE
doccls: UNCLASS
rtype: 1
rorient: 000,270
rpelcnt: 007200,004800
rdensy: 0400
notes: NONE

4.2.2 File Structure (MIL-R-28002)

file size: 188928
header size 2048: OK
record size 128: OK
header padding (^~^...): N/A

First line encoding: Valid CCITT T.6 encoding may indicate excessive white space due to over scan.

octal 177777 177777 177777
binary 1111111111111111 1111111111111111 1111111111111111
T.6 vertical(0) forty eight times

End-of-file mark: valid T.6 end-of-file code
octal 177740 001000 020040
binary 11111111100000 0000001000000000 0010000000100000
T.6 00000 0000001000000000 001
EOF

4.2.3 Image Presentation (CCITT Group-4)

- decompression: The file decompressed without coding errors and displayed the A&P scanner target, PM-189, oriented horizontally with the top edge to the right.
- cropped and centered: The image was complete and appeared to be positioned nearer the bottom right of the format frame. Manual decoding of the leading edge indicated excessive white space.
- orthographic alignment: Although presented without a border, the target appeared to be orthogonally aligned with the presentation frame. There appeared to be no distortion through skew or rotation and the parallel lines appeared to be linear.
- image continuity: There was at least one instance of image misalignment where the image did not register correctly. This may have been caused by a scanner strip registration problem. A portion of the left side of the chart is shifted in the vertical direction. The misalignment shows on all horizontal lines extending to the left side of the chart.
- image fidelity: The image appeared to be light with some line quality degradation. Thin lines were not accurately captured. The image was clean and free of background noise. Thick lines were well defined.

4.3 FILE "d113r001"

4.3.1 File Header Records (MIL-R-28002)

srcdocid: NONE
dstdocid: NONE
txtfilid: NONE
figid: NONE
srcgph: NONE
doccls: UNCLASS
rtype: 1
rorient: 000,270
rpelcnt: 009200,007200
rdensy: 0400
notes: NONE

4.3.2 File Structure (MIL-R-28002)

header size 2048: OK
record size 128: OK
header padding (^...): N/A

First line encoding:

octal 177774 123224 021003
binary 1111111111111100 1010011010010100 0010001000000011
T.6 11111111111111
vertical(0) fourteen times
 00 1
 horizontal
 010011010
 make-up(1600)
 010100 0
 terminate(24)
 010
 terminate(1)
 001
 horizontal

End-of-file mark:

octal 177770 000200 004040
binary 1111111111111000 0000000010000000 0000100000100000
T.6 000 0000000010000000 00001
 EOF

4.3.3 Image Presentation (CCITT Group-4)

decompression: The file decompressed without code errors. The image of a Century A&P Resolution test target was successfully displayed. The image was horizontally oriented with the top edge to the left.

- cropped and centered:** The image was complete and positioned in the center of the scanned format.
- orthographic alignment:** Parallel lines appeared linear with no perceptible image distortion. The aspect ratio appeared to be 1:1, no objects being "too fat" or "too thin". The image was skewed, with the left edge being lower than the right.
- image continuity:** The image was complete with no obvious dropouts or misalignments due to scanner read errors.
- image fidelity:** Image contrast was good. All lines were crisp with no background noise.

5 Conclusions and Recommendations

Three MIL-R-28002 files were transferred to the CTN on IBM formatted floppy disks. Two of the three images were decompressed and displayed. A third image, an "E" size drawing at 400 line per inch resolution was too large for the current CTN raster test tools and could not be displayed.

A 34x44 inch engineering drawing at 400 line per inch scanning resolution requires over 31 megabytes of memory to display. An image file this size is overwhelming to the average image system that is not targeted to handle such a special application, especially systems based on micro computer platforms.

MIL-R-28002 "3.1.1.4 Raster image density" states For typical technical documentation scanning, the raster image density is 300 lines per inch. For typical large format document scanning the raster image density is 200 pels per inch. This default density puts an "E" size drawing at roughly 7.5 megabytes, a much more reasonable image size.

The CTN should stipulate that these typical resolutions are suggested as standard for testing. Unless previously arraigned, the scanned resolution of image data submitted to the CTN should be commensurate with those suggested as typical.

Although CALS does not presently specifies the interchange of data on floppy disks, the standard does not preclude this option in the future. CALS standards could have been more accurately paralleled in the creation of the floppy disk by the addition of a declaration file as per MIL-STD-1840A "5.5.1 Declaration file". Additionally, the data file names should have been implemented as per MIL-STD-1840A "5.1.3 Data file name".

FORMTEK padded the empty area between the last header record and the beginning of the group-4 image data with "space" characters. This deviation from MIL-STD-1840A is analogous to the same issue covered in UCRL-ID-104021 and UCRL-ID-104022.

MIL-STD-1840A does not specify the character to use for padding. A vendor implementing a system which creates MIL-R-28002 files on other media such as magnetic disks is free to chose an appropriate character. When writing magnetic tape however, a vendor is required to use circumflex accent characters as required by ANSI X3.27.

MIL-STD-1840A (5.2.1.6 Raster files) should state "All the data header records shall be written in the first physical block of the file, with the block padded to the appropriate size by records filled with the "space" character.

The file structure of the MIL-R-28002 test files, sent to the CTN on floppy disk, indicates that FORMTEK can produce raster data files compatible with the CALS initiative.